



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/696,394

10/28/2003

Samantha S. H. Tan

10892/Y3

6372

31647 7590 10/28/2009
DUGAN & DUGAN, P.C.
245 Saw Mill River Road
Suite 309
Hawthorne, NY 10532

EXAMINER

SONG, MATTHEW J

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

10/28/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/696,394	Applicant(s) TAN, SAMANTHA S. H.	
	Examiner MATTHEW J. SONG	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 September 2009 and 22 June 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 and 26-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 and 26-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>9/21/2009</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 6-24, and 26-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan (WO 02/15255 A1) in view of Guldi (US 6,488,037) and Krogh (US 2003/0136428 A1).

In a method of cleaning semiconductor parts, note entire reference, Tan teaches a cleaning solution for cleaning parts includes 0.5-1.5 wt% Hf; 0.1-0.5 wt% HNO₃; and 1-10 wt% H₂O₂ for cleaning SiC ceramic parts (pg 7, ln 1-25). Tan also teaches a solution of HF/HNO₃ or HCl/HNO₃ at a concentration of 10-40 wt% for each chemical (pg 7, ln 25-32). Tan also teaches SiC can be found in chamber roofs, domes, rings and collars (pg 9, ln 1-10). Tan also teaches an ultrasonication cleaning process to a surface of a part can be cleaning, spray rinsing the part with a dilute chemical mixture, and spray rinsing the part with deionized water (pg 15, ln 30 to pg 16, ln 5). Tan also teach an ultrasonication step in deionized water (pg 21, ln 1-10) and an ultrasonication step in a chemical bath (pg 22, ln 1-32).

Tan teaches ultrasonication for quartz part, but is silent to the use of ultrasonication for SiC parts. Tan also does not teach an integrated system that is adapted for handling a multiplicity of silicon carbide materials.

Art Unit: 1792

In a method of cleaning a semiconductor wafer, note entire reference, Guldi teaches a conventional technique for improving the efficiency of a chemical bath cleanup is to insert a physical action into the cleanup. (col 1, ln 65 to col 2, ln 15). Guldi also teaches a variety of solvents such as deionized water, alcohol or HF (col 1, ln 1-65). Guldi also teaches conventional examples of physical action are injection of an inert gas into the chemical bath and ultrasonic energy to the bath resulting in a physical turbulence in the liquid that also dislodges contaminants from the wafer (col 1, ln 65 to col 2, ln 15). Guldi also teaches both gas bubbling and ultrasonic transduction may be used in combination in either a single wafer cleaning system or a bath cleaning system (col 7, ln 1-15). Guldi teaches a batch cleaning system and a wafer carrier containing a plurality of substrates (Fig 1 and col 4, ln 1-67), this clearly suggests applicant's integrated system that is adapted for handling a multiplicity of said silicon carbide materials during cleaning.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Tan by applying ultrasonic waves to the aqueous solution and the DI rinse while using a holder capable of supporting a plurality of substrates, as taught by Guldi to improve efficiency.

The combination of Tan and Guldi does not teach purging at least one opening within each of the silicon carbide materials using a continuous flow of nitrogen gas stream; wherein the purging the opening within each of the silicon carbide materials blocks migration of the aqueous solution of inorganic acid to a base material.

In a method of cleaning residues on a process chamber component, note entire reference, Krogh teaches a component having holes is at least partially immersed in a cleaning solution and

Art Unit: 1792

a non-reactive gas is passed through the holes to prevent the cleaning solution from back-flowing into the holes during the cleaning process (abstract), which clearly suggests blocking migration of the acid to the base material. Krogh also teaches the non-reactive gas may be nitrogen ([0013]).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Guldi by purging holes of a component during cleaning, as taught by Krogh, to prevent back flow into the holes during the cleaning process thereby reducing damage to the component during the cleaning process ('428 Abstract and [0003], [0004] and [0013]).

In regards to using an integrated system that is adapted for handling a multiplicity of silicon carbide material, this is an apparatus limitation in a method claim. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968). The use of an integrated system does not affect the process in a manipulative sense, thus is given little patentable weight. It is also noted that the combination of Tan, Guldi and Krogh teach an integrated system for handling a plurality of substrates.

In regards to the ultrasonication of the silicon carbide materials in an aqueous solution of inorganic acid after the purging has begun limitation, the combination of Tan, Guldi and Krogh teach flowing nitrogen gas after the component is immersed in the acidic solution to prevent back flow of the solution into the holes during the cleaning step ('428 [0013]). Therefore, the combination of Tan, Guldi and Krogh meets the claimed limitations because the purging occurs

Art Unit: 1792

while the component is immersed in the acidic solution and continues to flow to prevent back flow of the solution into the holes during the cleaning step.

In regards to the ultrasonication in a bath of deionized after the purging has begun limitation, the purging step occurs during the acidic cleaning step and the bath of deionized water step occurs after the acidic cleaning step; therefore the purging occurs before the ultrasonication in a bath of deionized water.

Referring to claim 6, Tan teaches chemical and mechanical process are applied to the part (pg 13, ln 1-20). The mechanical processes would read on applicant's scrubbing.

Referring to claims 7-8, Tan teaches a dilute chemical solution (abstract).

Referring to claim 9, Tan teaches HF/HNO₃ solution at concentrations of 10-40 wt% (pg 7, ln 15-30).

Referring to claims 9-18, 30, and 33, the combination of Tan, Guldi and Krogh does not teach all of the claimed ranges for temperature, power and frequency. These variable are result effective variable. Therefore, It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan, Guldi and Krogh by optimizing the temperature, power and frequency to obtain the claimed ranges by conducting routine experimentation of a result effective variable (MPEP 2144.05).

Referring to claim 27-28 and 31-32, Tan teaches a dilute HF and HNO₃ solution with concentration that overlap the claimed ranges (Abstract).

Referring to claim 29, Tan teaches HF/HNO₃ at much higher concentrations 10-40 wt% (pg 7, ln 20-32), overlapping ranges are held to be obvious (MPEP 2144.05).

Art Unit: 1792

Referring to claim 19, Tan teaches purge drying with in filtered N₂ and under a heat lamp for at least 1 hour (pg 23, ln 20-31) and heating in a furnace to 800°C and cooling to 200°C (pg 20, ln 10-25), this clearly suggests applicant's baking.

Referring to claim 20, the combination of Tan, Guldi and Krogh teaches cooling to 200°C from 800°C, this clearly suggests applicant's baking using 200-300°C.

Referring to claim 21, the combination of Tan, Guldi and Krogh does not teach the claimed baking time. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan, Guldi and Krogh optimizing the time to obtain the claimed time to optimize the time required ensure the wafers are dry.

Referring to claims 22-24, the combination of Tan, Guldi and Krogh does not teach the type of oven used during baking. The oven used is an apparatus limitation. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. In *re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968). Here, the use of a particular oven does not affect the process in a manipulative sense since any oven can achieve the claimed baking. Furthermore, the particular ovens claimed by applicant are known in the art to be used for drying.

Referring to claim 26, the combination of Tan, Guldi and Krogh teaches a pressure of at least 2 psi ('428 [0013]). Overlapping ranges are prima facie obvious (MPEP 2144.05).

Referring to claims 34 and 36, the use of particular materials for the integrated systems, this is an apparatus limitation in a method claim. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. In *re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968). The use of an chemically resistant materials that are flexible

Art Unit: 1792

or made high density polyethylene for the integrated system does not affect the process in a manipulative sense, thus is given little patentable weight. Furthermore, it is noted that polyethylene is well known in the art to be used as a material for construction of wafer carriers.

Referring to claim 35, the combination of Tan, Guldi and Krogh is silent to robotic mechanisms. This is an apparatus limitation. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. In *re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968). Here, the system comprising a robotic mechanism does not affect the process in a manipulative sense. Furthermore, the provision of a mechanical or automated means to replace a manual activity was held to have been obvious (*In re Venner* 120 USPQ 192 (CCPA 1958); *In re Rundell* 9 USPQ 220 (CCPA 1931). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan, Guldi and Krogh by providing a robotic mechanism to automate the process. Furthermore, robots are well known in the art to be used in the moving of substrates from an etching bath, to a rinsing bath and to a drying process, as evidenced by Lee (US 6,083,320) in column 1, lines 20-35.

Referring to claim 37-40, the combination of Tan, Guldi and Krogh does not teach a system is adapted to hold lift pins or showerheads, which is an apparatus limitation. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. In *re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968). Here, the system does not affect the process in a manipulative sense. Furthermore, changes in shape are held to be obvious (MPEP 2144.04). The combination of Tan, Guldi and Krogh teaches etching semiconductor components, which would include lift pins and showerheads; therefore adapting the system to handle lift pins would have been obvious to a person of ordinary skill in the art.

Art Unit: 1792

Referring to claim 41, this is an apparatus limitation. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. In *re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968). Here, the system having boats adapted for holding wafer rings does not affect the process in a manipulative sense.

Referring to claim 42, this is an apparatus limitation. Apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. In *re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968). Here, the use of peristaltic pump and manifold does not affect the process in a manipulative sense. Furthermore, pumps and manifolds are well known in the art and would have been obvious to a person of ordinary skill in the art.

3. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan (WO 02/15255 A1) in view of Guldi (US 6,488,037) and Krogh (US 2003/0136428 A1) as applied to claims 1, 6-21, and 27-42 above, and further in view of Applicant's admitted prior art (AAPA).

The combination of Tan, Guldi and Krogh teach all of the limitations of claims 2-3, as discussed previously, except a CVD SiC and a sintered SiC.

AAPA teaches several forms of silicon carbide materials used in the manufacture of semiconductor wafers, such as silicon carbide pins used as lift pins, wafer rings, and showerheads. AAPA also teaches lift pins, wafer rings and showerheads can be may be either sintering or CVD (pg 1, ln 15-25).

The combination of Tan, Guldi and Krogh teach a process used for cleaning semiconductor equipment part made of SiC and are not particular to any particular type of SiC. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the

Art Unit: 1792

invention to modify the combination of Tan, Guldi and Krogh by using CVD or sintered SiC parts since both are used as equipment in semiconductor manufacturing, as taught by AAPA. Selection of a known material based on its suitability for its intended purpose is held to be obvious (MPEP 2144.07).

4. Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan (WO 02/15255 A1) in view of Guldi (US 6,488,037) and Krogh (US 2003/0136428 A1) as applied to claims 1, 6-21, and 27-42 above, and further in view of Kitabatake (US 6,273,950).

The combination of Tan, Guldi and Krogh teach all of the limitations of claim 4, as discussed previously, except the act of oxidizing the silicon carbide material.

In a method of a manufacturing a silicon carbide device, note entire reference, Kitabatake teaches heating a silicon carbide material in an oxygen atmosphere to form a silicon dioxide thin film on the silicon carbide crystal surface at 1100°C, and etching the silicon dioxide film from the surface to prepare a clean SiC surface (abstract and col 16, ln 35-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan, Guldi and Krogh by oxidizing the silicon carbide material to form a useful silicon carbide device, as taught by Kitabatake.

Referring to claim 5, Kitabatake teaches 1100°C. Also, temperature are obvious to optimize (MPEP 2144.05).

Response to Arguments

Art Unit: 1792

5. Applicant's arguments with respect to claims 1-24 and 26-42 have been considered but are moot in view of the new ground(s) of rejection.

6. Applicant's arguments filed 6/22/2009 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., purging the openings of the silicon carbide materials before placing them in the solutions (pg 11 of the remarks) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The instantly claimed invention merely requires "ultrasonicing said silicon carbide materials in an aqueous solution of inorganic acid after the purging has begun" in lines 11-13 of claim 1. The claim does not require purging before placing the component in the solution. As discussed above in the rejection, the prior art teaches purging during the cleaning step (Krogh para [0013]), thus the ultrasonic cleaning continues after the purging begins which meets the claimed limitation of ultrasonic cleaning after purging has begun.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the non-reactive gas is flowed through the holes after the cleaning solution step (pg 11 of the remarks) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van*

Art Unit: 1792

Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Claim 1 recites, “ultrasonically treating said silicon carbide materials in a bath of deionized water after the purging has begun; and wherein purging using the continuous nitrogen gas stream continues during ultrasonically treating of said silicon carbide materials in the aqueous solution” in lines 13-18. The claim does not require nitrogen gas flowed through during the deionized water step. The claim merely requires the deionized water step occur after the purging has begun which is taught because the purging begins in the acid cleaning step which is prior to the deionized water rinsing step. Also, the claim merely requires purging continue during the aqueous solution step and does not require purging to continue during the deionized water step.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Art Unit: 1792

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. SONG whose telephone number is (571)272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song
Examiner
Art Unit 1792

MJS
October 24, 2009

/Robert M Kunemund/

Primary Examiner, Art Unit 1792